

## CLAIMS

What is claimed is:

1. A semiconductor assembly comprising:

a substrate having a plurality of circuits on a portion of a surface thereof;  
a semiconductor die having a plurality of bond pads located on an active surface thereof and  
having a back side surface;  
a plurality of solder balls connecting at least a portion of the plurality of bond pads of the  
semiconductor die to at least a portion of the plurality of circuits of the substrate;  
one of a glob top material and low viscosity polymeric material filling any space between the  
substrate and the semiconductor die;  
a gel elastomer contacting at least a portion of the back side surface of the semiconductor die,  
wherein the gel elastomer is compliant, adhesive, and filled with a thermally conductive  
material; and  
a heat sink cap covering the gel elastomer, the semiconductor die, the plurality of solder balls,  
and a portion of the substrate, the heat sink cap contacting at least a portion of the gel  
elastomer.

2. The semiconductor assembly of claim 1, wherein the heat sink cap includes a  
plurality of fins thereon.

3. The semiconductor assembly of claim 1, wherein the gel elastomer includes a  
cross-linked silicone.

4. A semiconductor assembly comprising:

a substrate having a surface having a plurality of circuits on a portion thereof;  
a semiconductor die having a plurality of bond pads located on a first portion of an active surface  
thereof and having a back side surface;

a plurality of solder balls connecting at least a portion of the plurality of bond pads of the semiconductor die to at least a portion of the plurality of circuits of the substrate; one of a glob top material and low viscosity polymeric material filling any space between the substrate and the semiconductor die;

a gel elastomer contacting a portion of the back side surface of the semiconductor die, wherein the gel elastomer is a cross-linked silicon gel, compliant, adhesive, and filled with a thermally conductive material; and

a heat sink cap having a portion thereof in contact with a portion of the gel elastomer, the heat sink cap covering the gel elastomer, the semiconductor die, the plurality of solder balls, and at least a portion of the substrate.

5. The semiconductor assembly of claim 4, wherein the heat sink cap includes a plurality of fins thereon.

6. An assembly comprising:

a substrate having a plurality of circuits on a portion thereof;

a semiconductor die having a plurality of bond pads located thereon and having a back side surface;

a plurality of solder balls connecting at least a portion of the plurality of bond pads of the semiconductor die to at least a portion of the plurality of circuits of the substrate;

one of a glob top material and low viscosity polymeric material filling any space between the substrate and the semiconductor die;

a compliant, adhesive, and filled with a thermally conductive material gel elastomer contacting at least a portion of the back side surface of the semiconductor die; and

a heat sink cap covering the compliant, adhesive, and filled with a thermally conductive material gel elastomer, the semiconductor die, the plurality of solder balls, and a portion of the substrate, the heat sink cap contacting at least a portion of the gel elastomer.

7. The semiconductor assembly of claim 6, wherein the heat sink cap includes a plurality of fins thereon.

8. The semiconductor assembly of claim 6, wherein the compliant, adhesive, and filled with a thermally conductive material gel elastomer includes a cross-linked silicone.

9. An assembly comprising:

a substrate having a plurality of circuits on a portion thereof;

a semiconductor die having a plurality of bond pads and having a back side surface;

a plurality of solder balls connecting at least a portion of the plurality of bond pads of the

semiconductor die to at least a portion of the plurality of circuits of the substrate;

one of a glob top material and low viscosity polymeric material filling any space between the

substrate and the semiconductor die;

a compliant, adhesive, and filled with a thermally conductive material gel elastomer contacting a portion of the back side surface of the semiconductor die ; and

a heat sink cap having a portion thereof in contact with a portion of the compliant, adhesive, and

filled with a thermally conductive material gel elastomer, the heat sink cap covering the

compliant, adhesive, and filled with a thermally conductive material gel elastomer, the

semiconductor die, the plurality of solder balls, and at least a portion of the substrate.

10. The semiconductor assembly of claim 9, wherein the heat sink cap includes a plurality of fins thereon.